

CLAIMS

1. A pressure-sensitive sensor (4) disposed in at least one of an opening (200) and an opening-closing unit (3) for opening and closing said opening, used for detecting contact of an object and preventing seizure of the object between said opening and said opening-closing unit, said pressure-sensitive sensor comprising:
pressure-sensitive means (12) for generating an output signal depending on deformation; and
support means (13) for supporting said pressure-sensitive means in at least one of said opening and said opening-closing unit,
wherein said support means has a greater flexibility than said pressure-sensitive means.
2. The pressure-sensitive sensor of claim 1,
wherein said support means includes:
a deformation amplifying portion (15) for amplifying the deformation of said pressure-sensitive means.
3. The pressure-sensitive sensor of claim 2,
wherein said deformation amplifying portion includes:
a hollow portion (16).
4. The pressure-sensitive sensor of claim 1,
wherein said support means includes:
a vibration damping portion (17) for damping vibration.
5. The pressure-sensitive sensor of claim 4,
wherein said support means includes:

a deformation amplifying portion (15) for amplifying the deformation of said pressure-sensitive means,

said vibration damping portion serves also as said deformation amplifying portion.

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6. The pressure-sensitive sensor of claim 1,

wherein said support means is formed of a part of a weather strip (18) of an automobile.

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7. The pressure-sensitive sensor of claim 1,

wherein said pressure-sensitive sensor can be disposed in said opening so that the shortest distance from said opening-closing unit may be in a range of 3 mm to 5 mm.

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8. The pressure-sensitive sensor of claim 1, further comprising:

plural electrodes (20, 21) for leading out signals; and

a resistor for detecting breakage (24) disposed between said electrodes for detecting breakage of said electrodes.

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9. The pressure-sensitive sensor of claim 1,

wherein said pressure-sensitive means is composed of a flexible piezoelectric sensor (12), and

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said support means flexibly supports said piezoelectric sensor along a shape of edge of said opening or said opening-closing unit.

10. The pressure-sensitive sensor of claim 9,

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wherein said piezoelectric sensor is molded by using a composite piezoelectric material mixing amorphous chlorinated

polyethylene, crystalline chlorinated polyethylene, and piezoelectric ceramic powder.

11. An object detecting device for detecting the contact of the
5 object, and preventing the seizure of the object between said opening (200) and said opening-closing unit (3) for opening and closing said opening, said object detecting device comprising:
- said pressure-sensitive sensor (4) of claim 1, 2, 3, 4, 5, 6, 7,
8, 9, or 10; and
- 10 judging means (5) for judging the contact of the object with said pressure-sensitive sensor on the basis of an output signal of said pressure-sensitive sensor.
12. The object detecting device of claim 11, further comprising:
- 15 notice means (40) for informing a third party of a judging result of said judging means.
13. The object detecting device of claim 11,
- wherein said pressure-sensitive sensor is connected
20 directly to said judging means, and said pressure-sensitive sensor and said judging means are integrated.
14. The object detecting device of claim 11,
- wherein said judging means includes:
- 25 a filter (30) for extracting only a specified frequency component from the output signal of said pressure-sensitive sensor.
15. The object detecting device of claim 11,
- 30 wherein said judging means calculates an integral value of

the output signal of said pressure-sensitive means per unit time, and judges the contact of the object with said pressure-sensitive sensor on the basis of the integral value.

- 5 16. The object detecting device of claim 11,
wherein said judging means includes:
an abnormality judging unit for judging abnormality
of said pressure-sensitive means on the basis of the output
signal of said pressure-sensitive means corresponding to
10 vibration of said opening or said opening-closing unit.
17. The object detecting device of claim 11,
wherein said judging means includes:
a signal input unit (33) for feeding the output signal
15 of said pressure-sensitive means;
a signal output unit (34) for issuing a judging result
of judging the contact of the object to said pressure-sensitive
sensor; and
a bypass unit (35) for passing high frequency signal
20 through between said signal input unit and said signal output
unit.
18. The object detecting device of claim 17,
wherein said signal input unit and signal output unit are
25 disposed closely to each other so as to shorten a bypass route of
high frequency signal.
19. An object detecting device for detecting the contact of the
object, and preventing the seizure of the object between said
30 opening (200) and said opening-closing unit (3) for opening and

closing said opening, said object detecting device comprising:

said pressure-sensitive sensor (4) of claim 9, or 10;

judging means (5) for judging the contact of the object with
said pressure-sensitive sensor on the basis of an output signal of
5 said pressure-sensitive sensor; and

a discharge unit (24) for discharging an electric charge
generated in said piezoelectric sensor disposed in at least one of
said piezoelectric sensor and said judging means.

10 20. An opening-closing device having a function for detecting
the contact of the object, and preventing the seizure of the object
between said opening (200) and said opening-closing unit (3) for
opening and closing said opening, said opening-closing device
comprising:

15 said object detecting device of claim 11, or 19;

drive means (6) for driving said opening-closing unit; and

control means (7) for controlling said drive means so as to
stop closing action of said opening-closing unit or open said
opening-closing unit when said judging means judges the contact
20 of the object with said pressure-sensitive sensor when said
opening-closing unit is closing.

21. The opening-closing device of claim 20,

wherein said control means includes:

25 a contact judging unit (38) of said opening-closing
unit for judging the contact of the object with said opening-
closing unit on the basis of a detected drive state when said
contact judging unit detects the drive state when said drive
means drives said opening-closing unit; and

30 a controller (7) for controlling said drive means on

the basis of an output signal from at least one of said object detecting device and said contact judging unit.

22. The opening-closing device of claim 21,

5 wherein said control means controls said drive means on the basis of an output signal of said contact judging unit if abnormality occurs in said object detecting device.

23. The opening-closing device of claim 20,

10 wherein said control means controls said drive means so as to close after once moving said opening-closing unit by a specific distance in opening direction or opening for a specific time when closing said opening-closing unit.